forming by atomic layer deposition one or more layers of a monocrystalline high dielectric constant oxide on the seed layer,

wherein providing a substrate includes providing a substrate having formed thereon a silicon oxide, and wherein forming by atomic layer deposition a seed layer further includes depositing a layer of a metal oxide onto a surface of the silicon oxide, flushing the layer of metal oxide with an inert gas, and reacting the metal oxide and the silicon oxide to form a monocrystalline silicate.

22. A method of fabricating a semiconductor structure comprising :

providing a silicon substrate having a surface;

forming by atomic layer deposition a monocrystalline seed layer on the surface of the silicon substrate; and

forming by atomic layer deposition one or more layers of a monocrystalline high dielectric constant oxide on the seed layer,

wherein providing a substrate includes providing a substrate having a layer of hydrogen formed thereon by hydrogen passivation, and wherein forming by atomic layer deposition a monocrystalline seed layer further includes desorbing the layer of hydrogen formed on the substrate, exposing the silicon substrate to a silicon precursor and at least one metal precursor thereby forming a layer of a silicon and a metal on the surface of the silicon substrate, flushing the layer of silicon with an inert gas to remove any excess silicon and metal precursor material, exposing the surface of the layer of silicon to at least one of oxygen (O_2) with or without plasma, water (H_2O), nitrous oxide (N_2O), or nitric oxide (NO) to oxidize the layer of silicon and metal thereby forming a single oxidized monolayer, and flushing the oxidized monolayer with an inert gas.

23. A method of fabricating a semiconductor structure as claimed in claim 22 further including repeating the atomic layer deposition to form monolayers.

24. A method of fabricating a semiconductor structure comprising :

providing a silicon substrate having a surface;

forming by atomic layer deposition a monocrystalline seed layer on the surface of the silicon substrate; and

forming by atomic layer deposition one or more layers of a monocrystalline high dielectric constant oxide on the seed layer,

whereby forming by atomic layer deposition one or more layers of a monocrystalline high dielectric constant oxide includes the steps of exposing the seed layer to a metal precursor, thereby forming a layer of metal, flushing the layer of metal with an inert gas, exposing the layer of metal to at least one of oxygen (O) with or without plasma, water (H2O), nitrous oxide (N_2O), or nitric oxide (NO) to oxidize the layer of metal thereby forming a single high-k oxidized monolayer, and flushing the oxidized monolayer with an inert gas.

25. A method of fabricating a semiconductor structure as claimed in claim 24 further including repeating the atomic layer deposition to form a monocrystalline high-k oxide layer of a desired thickness.

26. A method of fabricating a semiconductor structure comprising:

providing a silicon substrate having a surface;

forming by atomic layer deposition a monocrystalline seed layer on the surface of the silicon substrate, the seed layer formed of a silicate material; and

forming by atomic layer deposition one or more layers of a monocrystalline high dielectric constant oxide on the seed layer,

wherein forming by atomic layer deposition the seed layer of a silicate material includes forming the seed layer of a silicate material selected from the group of strontium silicon oxide ($SrSiO_4$), zirconium silicon oxide ($ZrSiO_4$), and hafnium silicon oxide ($HfSiO_4$),

wherein forming by atomic layer deposition one or more layers of a monocrystalline high dielectric constant oxide on the seed layer includes forming the layer of high dielectric constant oxide selected from the group of hafnium oxide (HfO_2), zirconium oxide (ZrO_2), strontium titanate ($SrTiO_3$), lanthanum oxide (La_2O_3), yttrium oxide (Y_2O_3), titanium oxide (TiO_2), barium titanate ($BaTiO_3$), lanthanum aluminate ($LaAlO_3$), lanthanum scandium oxide ($LaScO_3$) and aluminum oxide (Al_2O_3),

wherein providing a substrate includes providing a substrate having formed thereon a silicon oxide, and

wherein forming by atomic layer deposition a monocrystalline seed layer further includes depositing a layer of a metal oxide onto a surface of the silicon oxide, flushing the layer of metal oxide with an inert gas, reacting the metal oxide with the silicon oxide to form the silicate selected from the group of strontium silicon oxide ($SrSiO_4$), zirconium silicon oxide ($ZrSiO_4$), and hafnium silicon oxide ($HfSiO_4$).

27. A method of fabricating a semiconductor structure comprising:

providing a silicon substrate having a surface;

forming by atomic layer deposition a monocrystalline seed layer on the surface of the silicon substrate, the seed layer formed of a silicate material; and

forming by atomic layer deposition one or more layers of a monocrystalline high dielectric constant oxide on the seed layer,

wherein forming by atomic layer deposition the seed layer of a silicate material includes forming the seed layer of a silicate material selected from the group of strontium silicon oxide ($SrSiO_4$), zirconium silicon oxide ($ZrSiO_4$), and hafnium silicon oxide ($HfSiO_4$),

wherein forming by atomic layer deposition one or more layers of a monocrystalline high dielectric constant oxide on the seed layer includes forming the layer of high dielectric constant oxide selected from the group of hafnium oxide (HfO_2), zirconium oxide (ZrO_2), strontium titanate ($SrTiO_3$), lanthanum oxide (La_2O_3), yttrium oxide (Y_2O_3), titanium oxide (TiO_2), barium titanate ($BaTiO_3$), lanthanum aluminate ($LaAlO_3$), lanthanum scandium oxide ($LaScO_3$) and aluminum oxide (Al_2O_3),

wherein providing a substrate includes providing a substrate having a layer of hydrogen formed thereon by hydrogen passivation.

28. A method of fabricating a semiconductor structure as claimed in claim 27 wherein forming by atomic layer deposition a seed layer further includes desorbing the layer of hydrogen formed on the substrate, exposing the silicon substrate to a silicon precursor and at least one metal precursor forming a layer of a silicon and a metal on the surface of the silicon substrate, flushing the layer of silicon with an inert gas to remove any excess silicon and metal precursor material, exposing the surface of

the layer of silicon to at least one of oxygen (O_2) with or without plasma, water (H_2O), nitrous oxide (N_2O), or nitric oxide (NO) to oxidize the layer of silicon and metal thereby forming a single oxidized monolayer, and flushing the oxidized monolayer with an inert gas.

29. A method of fabricating a semiconductor structure as claimed in claim 28 further including repeating the atomic layer deposition to form oxidized monolayers.

30. A method of fabricating a semiconductor structure comprising:

providing a silicon substrate having a surface;

forming by atomic layer deposition a monocrystalline seed layer on the surface of the silicon substrate, the seed layer formed of a silicate material; and

forming by atomic layer deposition one or more layers of a monocrystalline high dielectric constant oxide on the seed layer,

wherein forming by atomic layer deposition the seed layer of a silicate material includes forming the seed layer of a silicate material selected from the group of strontium silicon oxide ($SrSiO_4$), zirconium silicon oxide ($ZrSiO_4$), and hafnium silicon oxide ($HfSiO_4$),

wherein forming by atomic layer deposition one or more layers of a monocrystalline high dielectric constant oxide on the seed layer includes forming the layer of high dielectric constant oxide selected from the group of hafnium oxide (HfO_2), zirconium oxide (ZrO_2), strontium titanate ($SrTiO_3$), lanthanum oxide (La_2O_3), yttrium oxide (Y_2O_3), titanium oxide (TiO_2), barium titanate ($BaTiO_3$), lanthanum aluminate ($LaAlO_3$), lanthanum scandium oxide ($LaScO_3$) and aluminum oxide (Al_2O_3),